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piano, swell it to forte and diminish it again, without getting off the pitch?

In regard to respiration an elaborate discussion leaves one in doubt as to what method to use, unless it be a slightly amplified natural breathing, which is, of course, correct. The author seems an advocate of 'chest resonance' as being very efficacious, whereas, in fact, it is extremely difficult to see how vibrations in a closed cavity of constantly changing volume can be called resonance or can reinforce a tone. A cavity to reinforce a tone must have a definite volume and opening; it must be open to the air, else how could its resonance increase the intensity of the tone outside?

Vocal resonators and their importance are well emphasized and treated, except for the inclusion of the sinuses, antra and chest among the reinforcing cavities. The latter part of this chapter is especially good.

Under 'tones and overtones' a deal of acoustics is introduced which ought to be free from such ideas as that "a simple fundamental tone is not known in music," or that "there are also lower partials or undertones."

The chapter on registers is very peculiar and inconsistent, and some remarkable ideas as to the mutual action of the vocal cords and resonant cavities are put forward which will scarcely receive the approval of physicists, even though supported by a mass of supposed evidence furnished by the stroboscope. The author is continually referring to the voice as if it were the result of reeds or membranes. The voice has a mechanism to control the length, tension and weight of the vocal cords; these are the factors which control the pitch of a string. The overtones in the voice belong to the series in which the first overtone is twice the rate of the fundamental, the second three and so on. This is the series of string overtones. The pitch of a reed depends upon its length, thickness and elasticity; the larynx has no means of varying such factors. The series of overtones given by a reed is different from that experimentally found in the voice.

We are thus forced to consider the vocal apparatus as a stringed instrument. Under tone placing we find Dr. Curtis' specialty, 'nodules of attrition' and their cure. His idea is that the

cords rub together, irritating each other, tearing each other, and even forming callous nodules. These he removes in a few hours by simple exercises. Other throat specialists have not observed these phenomena; and indeed how shall we believe a ragged or callous vocal cord could be cured by any exercises in a few hours. These ideas are fortified with numerous cuts of photographs of the vocal cords that associate none too well with the author's caustic remarks about touching up photographs to meet 'preconceived requirements.' Some of the advice given in this chapter is, however, worthy of approval.

It is rather remarkable that, after an elaborate discussion of the larynx, and breathing and the rest, the author should quote with evident approval Jean de Reske's epigrammatic statement that, '*la grande question du chant devient une question du nez.*' All we can do with the nose is to leave it open.

The chapter on voice building doubtless contains many good exercises and much good advice, inspired as it was by such a master of tone production as Madame Melba. The concluding chapter on voice figures contains numerous pretty pictures and interesting matter which is, however, foreign to the subject of the book.

There is much that is good in the book, but a desire to give a full discussion often leaves one in serious doubt as to the correct conclusions and renders it difficult for a novice to discriminate between the good and the bad.

W. HALLOCK.

Grundriss der Krystallographie für Studierende und zum Selbstunterricht. By DR. GOTTLÖB LINCK, Professor of Mineralogy at the University in Jena. Jena, Gustav Fischer. 1896. 8°. VI. and 255 pp. 2 colored plates and 482 figs.

Although the best treatises in crystallography are to be found in the German language, elementary text-books on the subject are as rare in Germany as in England or America. It is true that in nearly all books on mineralogy the principles of crystallography are discussed to some extent; and that occasionally the discussion is of value to the student. But in the great majority of cases it serves merely to bother him and to give him a distaste for that

most beautiful of all geometrical sciences—the study of the exact forms assumed by crystallizing substances.

In the little volume before us the author has endeavored to give the beginner in crystallography an insight into the subject in its various branches. The book occupies the same place in German scientific literature as does Dr. Williams's *Elements of Crystallography* (Holt & Co.) in English literature. It goes further than the latter book, however, in that it treats of the physical as well as of the geometrical properties of crystals.

The order of treatment in the volume is not quite as logical and consecutive as one would wish it to be in an elementary text-book. It opens with an 'Introduction' in which the general principles of geometrical crystallography are described (rather than discussed). In this portion of the book such subjects as coördinated axes, symmetry, zonal equations, parallel growths, twinned crystals and pseudomorphs are explained, some of which, it would seem, might better have been left unexplained until the student had mastered the characteristics of simple crystals.

The discussion of the six crystal systems occupies 132 pages—about one-half the volume. The discussion of each begins with a brief study of the symmetry of the holohedral forms; then follow the descriptions of the individual forms and of their simple combinations; and in conclusion the description of the hemihedral and tetartohedral forms. The derivation of the partial forms from the holohedral ones is not emphasized as it is in Williams's book. They are treated rather as forms in which certain planes of symmetry have disappeared.

The last 100 pages are devoted to an outline treatment of physical crystallography. The figures used here are well chosen to illustrate the text. All of them are fresh and some are entirely original. This portion of the volume deserves more extended notice than can be given it in this place, not because the subject-matter is startling in its novelty, but because the subject of which it treats is made so little of in this country, whereas, in reality, familiarity with it is indispensable to a true knowledge of the properties of crystals.

The chapters on hardness, etching and optical properties are especially interesting. Here more particularly than elsewhere will the student wish that the author had explained the logic of the conclusions reached through the study of the phenomena described. The chapter on the optical properties of crystals covers this difficult branch of crystallography in a very satisfactory general manner. The treatment is not full enough to enable the student to understand the optical methods of studying crystals, but it is sufficiently thorough to enable him to understand the principles upon which the methods are based.

The magnetic, electrical and thermal properties of crystals are next briefly referred to, and the volume closes with a condensed statement of the relations existing between crystals and their chemical composition.

On the whole, the book is an excellent introduction to modern crystallography; it is certainly the best book of its kind published in any language, and yet one cannot help feeling that the author has not produced a book that will serve 'für Studirende und zum Selbstunterricht.' In the hands of an instructor it should unquestionably serve a useful purpose and should make an excellent text-book.

The colored plates illustrate the appearance of the axial figures of crystals, the dichroism of tourmaline, etc., and the pyro-electrical properties of quartz, boracite and struvite.

W. S. B.

Chermotheca Italica Continens Exsiccatum, in Situ, Coccidarum Plantis, Precipue Cultis, in Italia Occurrentibus, Obnoxiarum. Cocciniglie raccolte in Italia. Fascicolo I. PROF. ANTONIO BERLESE e DR. LEONARDI GUSTAVO. Portici. 1896. Lire 10.

For a number of years sets of dried fungi have been published by mycologists in this country and abroad. The earliest works of this description were issued in Europe. The first distinctively American effort in this direction, as I am informed by Mr. B. T. Galloway, was made by H. W. Ravenel, of South Carolina, who published his *Fungi Caroliniani Exsiccati* from 1852 to 1860. Other writers, especi-